

E85 as a Vehicle Fuel



Module 1



Introduction to E85



What is E85?



 A mix of 85% ethanol and just 15% petroleum, E85 is a leading gasoline alternative in the U.S. and in other countries. Nearly 4 million E85-capable vehicles will be on U.S. roads in 2004, and E85 may be found at about 250 stations nationally. When E85 is not available, "flexible" fuel vehicles operate on any blend of ethanol or gasoline.

Courtesy NEVC

Little Known Fact



 Approximately 30% of all U.S. gasoline will be ethanol-blended in 2004. The ethanol molecule contains oxygen, and allows for more complete combustion, resulting in fewer emissions. Ethanol-blended gasoline is used in engines that require gasoline. Approval for ethanol is found in the owners' manual under references to fueling or gasoline.

Courtesy NEVC

Why **E85?**



- Domestically produced
- Renewable, most U.S. ethanol is made from the starch of corn
- E85 is an EPAct Alternative Fuel
- More OEMs available than any other alternative fuel



Why E85? - 2



- 10% ethanol blends reduce carbon monoxide by as much as 25%.
- Ethanol-blended fuel shows a 35-46% reduction in greenhouse gas emissions and a 50-60% reduction in fossil energy use.
- Ethanol contains 35% oxygen by weight, allowing ethanol-blended fuels to burn more completely than conventional gasoline.

Why E85? - 3



- E85 contains ~80% fewer gum-forming compounds than conventional gasoline.
- E85 contains ~80% less sulfur than typical gasoline, which helps protect a vehicle's catalytic converter - allowing it to function properly.
- Ethanol is highly biodegradable, making it less of a risk in to the environment.

E85 Economics



- Fleet fuel costs may be slightly higher than unleaded gasoline.
- Fueling station costs comparable or virtually the same as gasoline
- No or minimal vehicle price premium
- A range of light duty "flexible fuel vehicles" are produced

E85 Economics – 2



- Total operating costs approximately 13% higher
- Fuel:
 - E85 may cost 6%-18% higher per
 GGE than regular gasoline

E85 Economics — 3



- Oil
 - DaimlerChrysler
 - Special motor oil still recommended when using E85 100% of the time
 - GM, Ford & Others
 - Standard motor oil
 - Normal oil change frequency

E85 Performance



- Fuel economy up to 75%-85% of gasoline's MPGs based on fuel volume
- Range: Typically 80% to 85% of gasoline



2004 Chevy Silverado/GMC Sierra

E85 Performance



- Power, acceleration, payload and cruise speed comparable to gasoline
- Fueling time: same as gasoline
- Pure, 100% ethanol has an octane rating of 113.
- Adding 10% ethanol to unleaded gasoline raises the octane by 2 - 3 points.
- Ethanol is used in racing because of these high-performance characteristics.

Module 2



Properties and Characteristics of E85

Module 2 Learning Objectives



- Understand E85 and how it compares to other fuels
- Be familiar with E85 characteristics



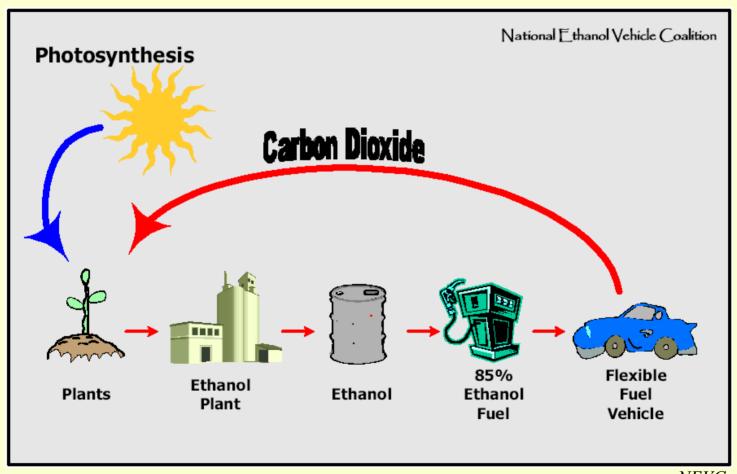
Production



- Ethanol is a renewable fuel produced from corn, other grains or 'starchy' wastes
- Fermentation into grain alcohol
- Denatured with addition of gasoline or 'drip gas' (product of natural gas refining)

Production - 2





source: NEVC

Chemical Composition



- Ethyl alcohol or EtOH
- E85 refers to 85% ethanol/15% gasoline
- Petroleum added to:
 - Improve cold-start
 - Increase flame luminosity
 - Denature or 'poison' ethanol (grain alcohol)

E85 Characteristics



- Make no mistake . . . E85 is poisonous!
- Ethanol is less of a risk to ground water or soil
- Ethanol used as
 - E85 (85% E85/15% gasoline blend)
 - E70 during winter months is important
 - Raises the vapor pressure
 - Improves starting in cold temperatures

Appearance and Smell



- Colorless to slight tint
- Odor pleasant smell



E85 Properties



Fuel value

- Octane
 - E85: 100-plus octane (as high as 105 or more)
 - Typical Gasoline: 86-94
- Lower heating value (~27% less energy)
 - E85: 87,250 BTU/gal
 - Gasoline: 114,000 BTU/gal

Module 3



E85 Fueling Stations



Module 3 Learning Objectives



- Understand similarity to normal gasoline fueling
- Be familiar with safety practices

Fueling



- No high pressure fueling as in CNG or H2
- E85 fueling practices are identical to gasoline fueling



Fueling Station Components



E85 storage



Fueling Station Components



- Dispenser(s)
- Station Controls
- Emergency shutdown

system



Developed for DOE by AFV Institute



AFVI ALTERNATIVE FUEL VEHICLE INSTITUTE

Fueling Station

- Aluminum parts should be replaced with stainless steel:
 - Especially the nozzle.
- Teflon hose
- 1- or 2-micron dispenser filter
- ~\$2,500 to convert typical gasoline system for dispensing E85

Facility Layout Plan



- May exist for private stations
- Designates important information such as:
 - Fuel storage tank locations
 - Emergency equipment switches
 - Fire extinguishers
 - Pre-planned evacuation routes
 - Designated assembly areas
 - Street address of facility

Module 4



Safety Practices and Emergency Action Plan



Module 4 Learning Objectives



- Know basic safety practices
- Understand purpose and content of Emergency Action Plan
- Be familiar with signage and emergency equipment
- Understand emergency actions

Safety Practices



- Same as gasoline
- Emergency telephone numbers
 - Fire department
 - Emergency medical help
 - Police
 - Maintenance
 - Adjoining facilities
- Safety Signs

Safety Practices – 2



- Equipment condition and inspection
 - Before using, inspect
 - Hoses, joints, break-away valves, etc.
 - Fueling nozzle and receptacle
 - Do not use defective or equipment incompatible with high-blend alcohol
 - Report defective equipment

Safety Practices – 3



- Turn off/do not use cell phone or other distractions while fueling
- Do not re-enter vehicle during fueling
- Keep ignition sources away from E85
- Do not light matches or smoke cigarettes

Purpose of Emergency Action Plan



- Identification of emergencies
- Action items
- Notification procedures
- Evacuation procedures
- Safety systems
- Emergency event action items

If There's a Fire Involving E85



- Do not attempt to disconnect nozzle from vehicle
- Evacuate immediate area of fire
- Trigger ESD button
- Contact fire department

Module 5



What Makes an FFV Different?



Module 5 Learning Objectives



Understand Flex Fuel Vehicle (FFV)
 Basics

AFV? ALTERNATIVE FUEL VEHICLE INSTITUTE

Flex Fuel Vehicles (FFVs)

- Run on any ethanol blend up to 85%
- Any mix of gasoline or E85 from 100% gasoline to all E85 – interchangeably.
- On E85 10% to 25% mileage reduction vs. gasoline. In practical terms, this may be:

	Gasoline Range	E85 Range
Model A	340	250
Model B	470	340

How FFVs Work - 1



- Engine Control Module (computer) determines fuel blend
- FFVs may fuel with any E85 or gasoline combination
- Uses same fuel gauge
- Uses same fuel filler entry point

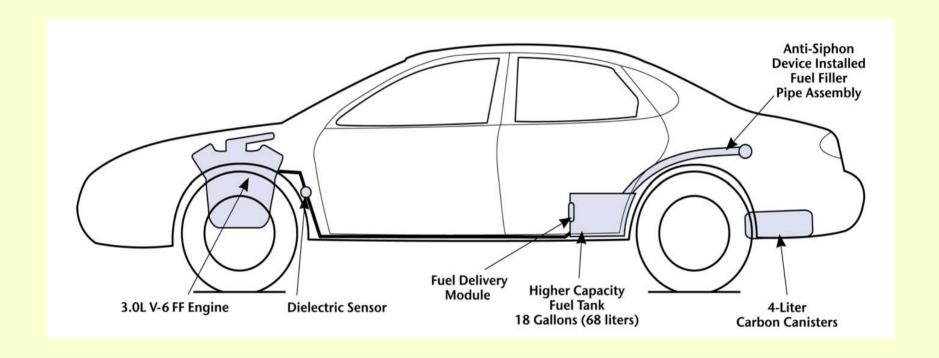
How FFVs Work - 2



- Computer adjusts fuel injection and timing for different fuel mixtures
 - No switches, no mixing or blending required
 - All fueling in same fuel system
 - No special training needed
- No additional fuel tanks needed



How FFVs Work - 3



Module 6



E85 in Review



E85



- Fewer tailpipe & evaporative emissions
- Renewable-based, domestic fuel
- Little or no incremental cost on FFVs
- 85% ethanol/15% gasoline
- Safety practices similar to gasoline
- ESD is key safety device

